

## The Effect of Debt Diversification on Firm Value and Stock Price Crash Risk

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**Abstract:** Debt diversification is a common practice among corporate firms around the world. However, the effect of debt diversity on company value is missing from the current literature. Stock price crash is defined as a very large and unusual negative shift in stock prices that occurs without a significant economic event and is considered as a phenomenon tantamount to negative skewness in stock returns. The purpose of this paper is to study the effect of debt diversification on the value of the firm and stock price crash risk among companies listed on the Tehran Stock Exchange. The number of sample companies was 157 firm-year observations in a 5-year period (2012-2016). Excel software was employed to calculate and classify the research variables. Then, research hypotheses were tested using the multivariate regression analysis in Eviews software. The results of the research indicate that debt diversification does not have a significant effect on the value of the firm, yet it has a significant effect on stock price crash risk. Moreover, the relationship between debt diversification and firm value does not have a significant effect on stock price crash risk.

**Keywords:** Debt diversification, Firm value, Stock price crash risk

### 1. Introduction

Debt diversification is common among companies around the world. Rauh and Sufi (2010) found differences in the choice of borrowing sources between low-credit and high-credit companies, as well as their credit ratings. Creditors, on the other hand, have their own motives for specializing, as debt structure can be used as a tool to reduce the costs of a particular agency. Creditors try to exploit agency complications, such as asset replacement risk. They tend to control more risky companies or those which have a debt repayment threat strategy, and in the process, they are looking for ways to reduce some agency costs. Creditors prefer to gather all possible information in risk companies that require a high level of debt expertise, which can increase the level of debt expertise for these companies. One of such risks is the stock price crash risk.

Stock price crash is a phenomenon in which stock prices experience sharp negative and sudden adjustment (Chen and Hong, 2014). Also, public debt holders monitor firms' activities by building trust to ensure adherence to the Covenants (Mayer et al. 1989). On the other hand, one of the most important ways to manipulate accounting information is to hasten the identification of good news in contrast to delaying the identification of bad news in profit (Callen and Fang, 2013). However, there is always a breaking threshold for accumulating bad news in the company, the arrival of which will eventually leads to the sudden full disclosure of such news, making the investors' mindsets distorted towards the value of the firm and, as a result, the firm's stock price. This will eventually lead to company's stock price to crash. There are usually two main reasons behind stock price crash: (1) due to selfish motives (for its own self-interest) or benevolent acts (for the purposes of the organization), the management of a firm overstates the firm's performance by postponing the propagation of bad news and accelerating the propagation of good news – a process which creates a bubble in the firm's stock price; and (2) the other reason is the accounting system of the firm and its role in the aforementioned practice (Callen et al., 2013). Given the above explanations and clarifying the importance of debt diversification, this paper seeks to investigate the relation between the value of the firm and the stock price crash risk for companies listed on the Tehran Stock Exchange.

### 2. Discussion

Debt diversification is a method in which managers rely on risky behaviors to encourage the interests of shareholders that potentially hinders their interest. (Jadiyappa et al., 2018). Debt diversification can help managers in two ways. The first is the issue of intrinsic freeriding in multiple-bank lending situations (Carletti et al., 2007), and second, when firms have access to debt from different sources, the average amount received from each resource decreases, which in turn discourages lenders to monitor activities of the company (Park, 2000) It is not yet discussed in the literature to what extent companies manage their bond renewal dates by distributing maturities. The fixed cost components of securities issuance and secondary market liquidity considerations cause companies to accumulate their debt in one or more issuance. However, non-financial firm often have several types of overdue securities with different maturities. This shows a new aspect of debt structure that has potential significance, yet it was previously unknown.

On the other hand, stock price crash is a phenomenon in which stock prices are subject to severe, negative and sudden adjustments. There are usually two main reasons behind stock price crash: (1) due to selfish motives (for its own self-interest) or benevolent acts (for the sake of the organization), the management of a firm overstates the firm's performance by postponing the disclosure of bad news and accelerating the propagation of good news – a process which creates a bubble in the firm's stock price; and (2) the other reason is the accounting department of the firm and its part in the aforementioned practice. Various researchers have reported some of the causes of this phenomenon, namely shareholders' focus on the effects of feedback from market fluctuations, heterogeneity of investors' viewpoints, profit management, lack of transparency in financial information, unrealistic evaluation of analysts from firm performance, tax evasion, persistence of current projects with negative value, and managers' job concerns among others. The risk of stock price crash in the market is one of the most prominent concerns of the investors. When the bad news hidden by managers in the company reaches its explosion threshold, it suddenly spreads and investors hastily market their shares for sale, which leads to a steep fall in the company's stock price in the market. The crash of stock prices is seen as a sudden and negative reconsideration in investors' expectations of a company's stock (Abdoli and Arab-Haji, 2014).

Previous research has focused on two aspects of diversification: determinants of debt diversity (Rauh and Sufi, 2010; Colla et al., 2013) and the impact of debt diversity on certain specific characteristics of the firm (Dimond, 1991; Rajan, 1992; Huang and Ramirez, 2010).

### 3. Research Background

Jadiyappa et al. (2020) examined the effect of debt diversification on firm value. Their findings indicate that the negative impact of debt diversity on the value of the company, especially in firms, is dependent on the group. This negative effect is attributed to freeriding among lenders, as evidence suggests that increased agency costs due to bottom monitoring contribute to company's worse accounting performance. Furthermore, debt diversity does not appear to reduce financial constraints.

Agnes Cheng et al. (2020) examined the effect of lack of transparency of the operating cash flow and stock price crash risk. Their results show that obscurity of the operating cash flow after the control for accrual obscurity and other factors known to affect the risk of an accident has a positive effect on the prospective crash risk of stock prices. The finding suggests that obscurity in the operations cash flow facilitates the concealment of bad news and diverts management resources, which in turn increases the crash risk. Moreover, the findings indicate that the positive relationship between operational cash flow obscurity and crash risk is low with weak external monitoring, high with information asymmetry, low with operating cash flow importance, and high with management cost of liabilities. In general, evidence suggest strong reverse consequences in operational cash flow obscurity, itself leading to higher crash risk.

In Iran, Torabi and Eskandari (2015) examined the effect of operational diversification on financing constraints in selected industries listed on the Tehran Stock Exchange during the period of fiscal years of 2009-2014. The results show that the effect of the independent variable of the Herfindahl-Hirschman Index on the financing constraint variable is positive and significant. The effect of the independent variable of operating capital flow on the financing constraint variable, which was calculated in this study through dividing total debt by total assets, is negative and statistically significant. Moreover, the effect of the independent variable of growth rate of the business main income on the variable of financing constraint is also negative and significant. The effect of the independent variable of the equity return index on the financing constraint is negative and significant. The effect of the independent variable of the natural logarithm of the total assets on financing constraint is positive and significant. The effect of the index of total return on assets on financing constraint is negative and significant.

Hajiha and Maghami (2014) studied the impact of corporate diversification strategy on the debt cost of companies listed on the Tehran Stock Exchange. Their findings show that there is a significant negative relationship between geographical diversification and debt cost. Moreover, the results show that firm with higher growth experience lower debt costs. No significant relationship was found between other control variables and debt cost.

### 4. Research hypotheses

Debt diversification has a significant effect on the value of the firm.

Debt diversification has a significant effect on stock price crash risk.

The relationship between debt diversification and company value has a significant effect on stock price crash risk.

### 5. Research Method and Statistical Population

The hypotheses of this research have been modeled in the form of specific regression equations, and therefore it is necessary to examine the fundamental assumptions of these important relationships before testing the regression equations and analyzing their results.

Statistical population: Firms listed on the Tehran Stock Exchange. In order to conduct research, a statistical sample of companies listed on the stock exchange and securities from 2012 to 2016 has been selected with the following eligibility criteria:

The required information for the firms should be available for fiscal years of 2012 to 2016.

The end of the financial year of the firms should be March 20th, and remain unchanged for the period of 2012 to 2016.

The shares of the companies have been traded on the stock exchange during each of the years of the research period and the end price of the course is available.

The company should involve in financial brokering or investment.

Taking the aforementioned criteria into account, 157 firm were selected using the random sampling method as the final sample.

## 6. Research model

The research model was derived from the model introduced in Jadiyappa (2020):

$$Y_{it} = \alpha_i + \beta_1 \text{Debt\_Div}_{it} + \beta_2 \text{Firm\_Size}_{it} + \beta_3 \text{Age}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{R\_D\_Ratio}_{it} + \beta_6 \text{MLevit-1}_{it} + \epsilon_{it}$$

$$\text{Risk Crash}_{it} = \alpha_i + \beta_1 \text{Debt\_Div}_{it} * Y_{it} + \beta_2 \text{Firm\_Size}_{it} + \beta_3 \text{Age}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{R\_D\_Ratio}_{it} + \beta_6 \text{MLevit-1}_{it} + \epsilon_{it}$$

In which:

Y is the firm value measured using Tobin's-q ratio;

Risk Crash is the stock price crash risk. If the return on a company's stock in a particular financial interval is lower than the return on the overall market index, the probability of a decline in stock price during that period increases. In this study, crash risk is a dummy variable that attains the value of one in case there is at least a period of decline by the end of the fiscal year, and otherwise zero. The firm specific monthly return is calculated using the following equation:

$$W_{j,t} = \ln(1 + \epsilon_{j,t})$$

In which  $W_{i,t}$  is the specific monthly return of firm j in month t;

$\epsilon_{j,t}$  is the return on residual stocks of firm j in month t,

$$R_{i,t} = \alpha_{0i} + \alpha_{1i}R_{m,t-2} + \alpha_{2i}R_{m,t-1} + \alpha_{3i}R_{m,t} + \alpha_{4i}R_{m,t+1} + \alpha_{5i}R_{m,t+2} + \epsilon_{i,t}$$

$R_{i,t}$  is the return of the company i for the month t during the fiscal year;

$R_{m,t}$  is the return of the market for the month t.

Based on the above relationship, the price reduction periods for each of the sample companies on a monthly basis are determined. If for a given year, the value of one or more of the obtained  $W_{j,t}$  is less than 2.3 standard deviations minus their average in the same year, it means that in that year the share price has crashed and in that case the variable of crash will take the numerical value of one (1) and otherwise take the value of zero.

Debt\_Div: The variable of debt diversification is measured through the number of debt sources a company has used. Eleven separate debt sources are considered for this study: debt to the central bank, debt to group companies, deposits and prepayments, debt to other banks and trust institutions, demand deposits, Qarz al-Hasna deposits, long-term investment deposits, debt of the bank for accepting foreign currency credits, debt to insurers and agents, debt to reinsurers, reinsurance deposit, and debt to Central Insurance of Iran.

Firm\_Size: The size of the firm which is calculated through the logarithm of all assets;

Age: Firm age;

Growth: Firm Growth;

R\_D\_Ratio: the ratio of research and development costs to all assets;

MLev: Financial leverage that is calculated from dividing all debts to all assets;

### 7. Research Findings

Descriptive statistics of research variables are presented in Table (1).

**Table 1.** Descriptive statistics of the research

	Debt Diversification	Crash Risk	Firm Value	Firm Growth	Leverage	R & D	Firm Size	Firm Age
<b>Median</b>	466932.3	0.325057	0.406971	1.123976	0.596295	0.000356	27.79260	2.683057
<b>Average</b>	9790.000	0.283237	0.406362	1.117217	0.598221	0.000000	27.57757	2.708050
<b>Max</b>	60115889	3.215782	0.909836	1.695086	2.077506	0.018292	32.92171	3.871201
<b>Min</b>	0.000000	-2.869273	-1.077506	0.094835	0.090164	0.000000	23.98205	1.098612
<b>SD</b>	3345894.	0.843858	0.205070	0.178084	0.209426	0.001442	1.511251	0.466280
<b>Observations</b>	785	785	785	785	785	785	785	785

**Testing hypotheses:**

Hypothesis 1: Debt diversification has a significant effect on firm value.

**Table 2.** The effect of debt diversification on company value

Variables	Coefficient	SD	T-statistics	P-value
<b>Debt Diversification</b>	-6.31E-10	1.42E-09	-0.444232	0.6570
<b>Firm Growth</b>	0.097980	0.017087	5.734169	0.0000
<b>Financial Leverage</b>	-0.401275	0.031524	-12.72928	0.0000
<b>R&amp;D Costs</b>	-0.248645	1.090418	-0.228028	0.8197
<b>Firm Size</b>	0.041976	0.010044	4.179093	0.0000
<b>Firm Age</b>	-0.095109	0.024965	-3.809644	0.0002
<b>Fixed Element</b>	-0.374946	0.247062	-1.517622	0.1296
<b>Determination coefficient</b>	0.949019			
<b>Adjusted determination coefficient</b>	0.935740			
<b>Durbin-Watson Statistic</b>	2.201050			
<b>F-statistic</b>	71.47238			
<b>Regression possibility</b>	0.000000			

Based on the above table, it is observed that the P-Value for F-statistics, which implies the statistical significance of the whole regression, is 0.000000 and indicates that the model is significant in 99% confidence interval. Also, the Durbin-Watson Statistic for the regression is between 1.5 and 2.5, which is appropriate and indicates the rejection of self-correlation assumption. The hypothesis test results show that debt diversification does not have a significant effect on firm value.

Hypothesis 2: Debt diversification has a significant effect on stock price crash risk.

**Table 3. The effect of debt diversification on the risk of falling stock prices**

Variables	Coefficient	SD	T-statistics	P-value
<b>Debt Diversification</b>	5.19E-08	1.62E-08	3.194801	0.0015
<b>Firm Growth</b>	0.377226	0.142984	2.638244	0.0085
<b>Financial Leverage</b>	0.514731	0.209081	2.461877	0.0141
<b>R&amp;D Costs</b>	-37.07678	24.19090	-1.532674	0.1259
<b>Firm Size</b>	0.171738	0.108478	1.583163	0.1139
<b>Firm Age</b>	-1.297268	0.251537	-5.157370	0.0000
<b>Fixed Element</b>	-1.709320	2.708681	-0.631052	0.5282
<b>Determination coefficient</b>	0.381925			
<b>Adjusted determination coefficient</b>	0.220947			
<b>Durbin-Watson Statistic</b>	2.504678			
<b>F-statistic</b>	2.372530			
<b>Regression possibility</b>	0.000000			

Based on the above table, it is observed that the P-Value for F-statistics, which implies the statistical significance of the whole regression, is 0.000000 and indicates that the model is significant in 99% confidence interval. Also, the Durbin-Watson Statistic for the regression is between 1.5 and 2.5, which is appropriate and indicates the rejection of self-correlation assumption. The hypothesis test results show that debt diversification has a significant effect on stock price crash risk.

Hypothesis 3: The relationship between debt diversification and firm value has a significant effect on stock price crash risk.

**Table 4. The relationship between debt diversification and firm value on the risk of falling stock prices**

Variables	Coefficient	SD	T-statistics	P-value
<b>The relationship between debt diversification and firm value</b>	7.48E-08	8.47E-08	0.883374	0.3774
<b>Firm Growth</b>	0.397876	0.142824	2.785782	0.0055
<b>Financial Leverage</b>	0.526603	0.209053	2.518991	0.0120
<b>R&amp;D Costs</b>	-36.84272	24.21075	-1.521751	0.1286
<b>Firm Size</b>	0.182252	0.108394	1.681387	0.0932
<b>Firm Age</b>	-1.290971	0.253159	-5.099456	0.0000
<b>Fixed Element</b>	-2.032339	2.703306	-0.751798	0.4525
<b>Determination coefficient</b>	0.377714			
<b>Adjusted determination coefficient</b>	0.215639			

<b>Durbin-Watson Statistic</b>	2.508489
<b>F-statistic</b>	2.330493
<b>Regression possibility</b>	0.000000

Based on the above table, it is observed that the P-Value for F-statistics, which implies the statistical significance of the whole regression, is 0.000000 and indicates that the model is significant in 99% confidence interval. Also, the Durbin-Watson Statistic for the regression is between 1.5 and 2.5, which is appropriate and suggests that self-correlation assumption is rejected. The hypothesis test results show that the relationship between debt diversification and firm value does not have a significant effect on stock price crash risk.

## 8. Conclusion

Firms' debt policies remain unclear over time. On one hand, information-based theories on the evolution of corporate financing and entrepreneurial commercial firm argue that debt policies change based on the age of the company, as companies provide more information to the market and establish rapport with private investors. Despite the international prevalence of debt diversification, the consequences and effects of the debt diversification have not yet been fully explored. One of the issues that has been widely considered by financial researchers is the sudden change in stock prices, which occurs in both forms of steep fall or growth. Given the significance the investors place on their stock returns, the phenomenon of stock price crash, which leads to a sharp decline in returns, has received more attention from researchers compared to price hikes. The results show that debt diversification does not have a significant effect on company value. Also, debt diversification has a significant effect on stock price crash risk. Finally, the relationship between debt diversification and company value does not have a significant effect on stock price crash risk.

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